CR timer

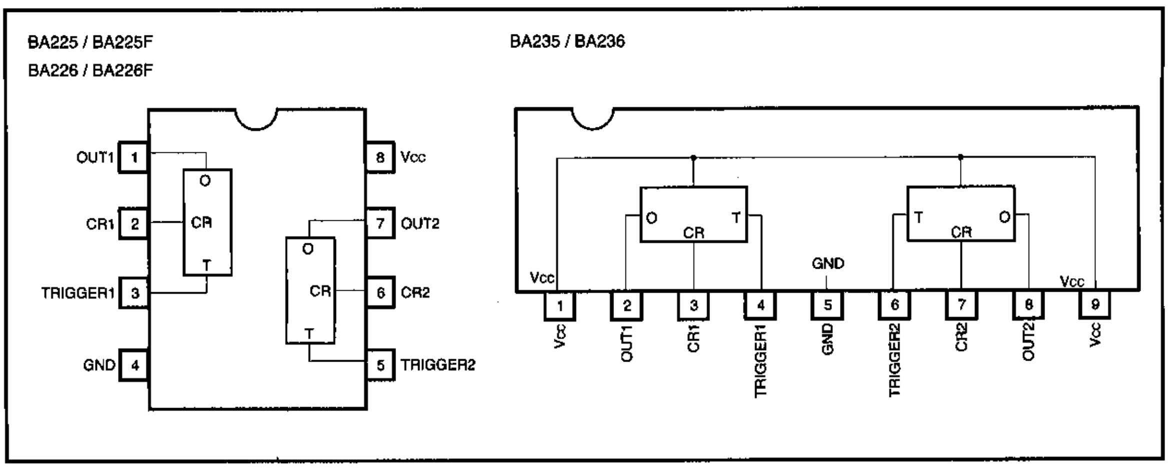
BA225/BA225F/BA235/BA226/BA226F/BA236

The BA225, BA225F, BA235, BA226, BA226F, and BA236 are monolithic ICs having independent mono and multi circuits which consume very low current (0.75mA typ.). Using external resistors and capacitors, the timing control time can be set within a range from 0.01ms to 100ms.
As the BA225, BA225F, and BA235 are triggered at the rising edge of the signal, they have no trigger input differentiating circuit and can be used in measuring instruments, control devices, digital data systems and other equipment as sub-compact attachments. The BA226, BA226F, and BA236 are available as falling edge trigger types.

●Applications
Delay timers
Mono / multi timing controllers (ideal for VTR system controllers)
Pulse generators

●Features
1) As these are edge trigger types (BA225 / BA235 : rising edge trigger types, BA226 / BA236 : falling edge trigger types), there is no need for an input differentiating circuit.
2) The dual type design enables delay timer configuration.
3) Fewer attachments are required.
4) Current consumption is as low as 0.75mA for each circuit.
5) Uniformity in the circuit current between high and low output states simplifies the design of the power supply section.
6) Wide operating power supply voltage range of 4.0V to 16V.
7) The BA235 and BA236 pin layouts are symmetrical, allowing reverse insertion.
8) Hysteresis in the input results in a high level of noise withstand resistance.

●Block diagram



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Power supply voltage		Vcc	16	V
Power dissipation	BA225 / BA226	Pd	800 *1	mW
	BA235 / BA236		950 *2	mW
	BA225F / BA226F		450 *3	mW
Operating temperature		Topr	−20~75	℃
Storage temperature		Tstg	−55~125	℃

*1 Reduced by 8 mW for each increase in Ta of 1°C over 25°C .

*2 Reduced by 9.5 mW for each increase in Ta of 1°C over 25°C .

*3 Reduced by 4.5 mW for each increase in Ta of 1°C over 25°C .

●Electrical characteristics (unless otherwise noted, Ta=25℃, V_{CC}=5V)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Power supply voltage		V_{CC}	4.0	5.0	16.0	V	—	Fig.7
Quiescent current		I_Q	—	1.5	3.0	mA	—	Fig.7
Timing error		T_{ERR}	—	1	10	%	R=100kΩ, C=0.1μF *1	Fig.7
Timing change with power supply		T_{DS}	—	0.5	3.0	%	5V→16V	Fig.7
Timing change with temperature		T_{DT}	—	200	—	ppm/℃	—	Fig.7
Trigger voltage		V_T	1.0	2.0	3.0	V	*2	Fig.7
	BA236		0.7	1.6	2.5			
Trigger current		I_T	—	70	200	μA	V_T=3.0V (BA225 / BA235) V_T=2.5V (BA226 / BA226F / BA236)	Fig.7
"L" output voltage		V_{OL}	—	0.5	1.0	V	I_{SINK}=5mA	Fig.7
"H" output voltage		V_{OH}	3.0	4.0	—	V	I_{SOURCE}=5mA	Fig.7

*1 One-shot cycle T= 0.5 CR

*2 With input hysteresis (hysteresis width≒200 to 600 mV)

●Electrical characteristic curves

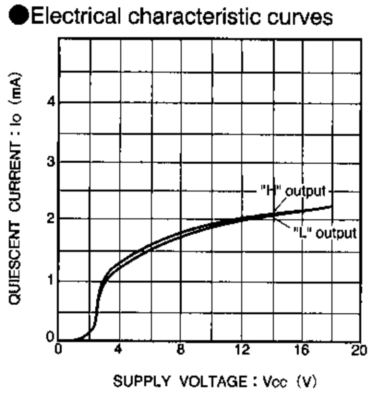


Fig. 1 Quiescent current - power supply voltage characteristic

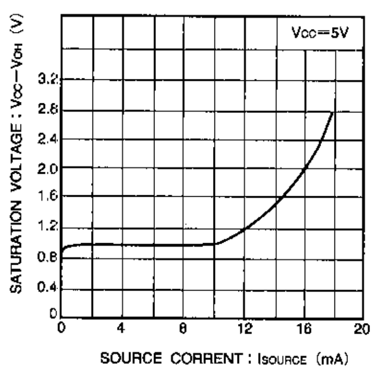


Fig. 2 Output voltage (logic 1 side) characteristic

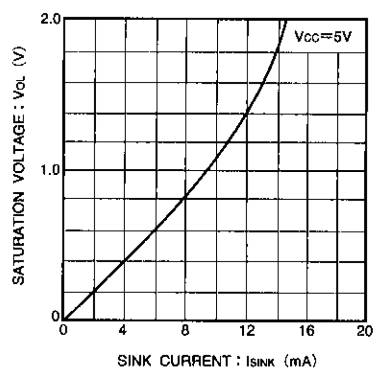


Fig. 3 Output voltage (logic 0 side) characteristic

● Electrical characteristic curves

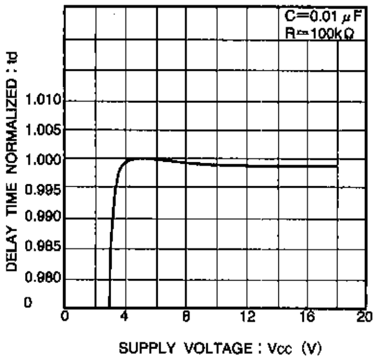


Fig. 4 Power supply voltage - delay time characteristic

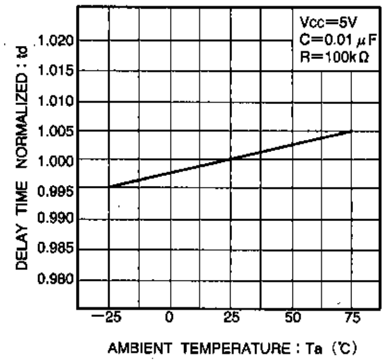


Fig. 5 Temperature - delay time characteristic

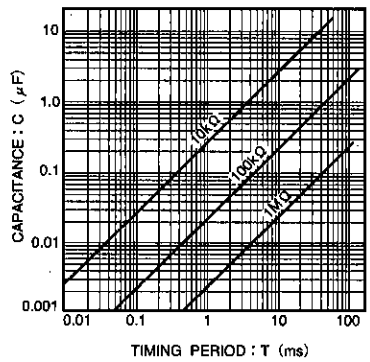


Fig. 6 One-shot time characteristic

● Measurement circuit

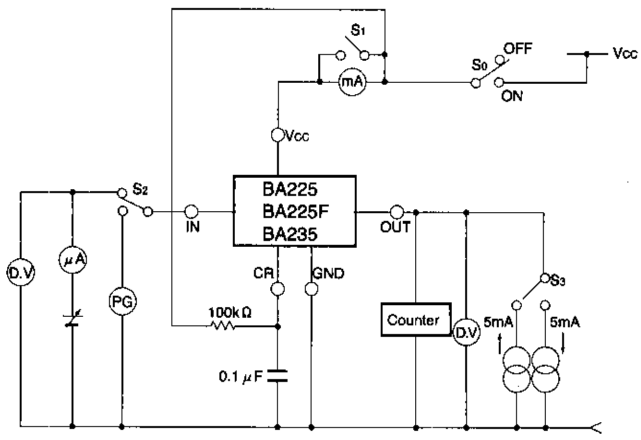


Fig.7

● Description of attachments

(1) Timing capacitors (Pins 2 and 6)

Connected between these pins and the ground (GND), this capacitor determines the one-shot period. We recommend using a capacitor with a value greater than 1000pF. The one-shot cycle is determined by T = 1 / 2 C·R.

(2) Timing resistor (Pins 2 and 6)

Connected to the power supply line, these resistors determine the one-shot period. The timing capacitor is charged through this resistor. The recommended range for the timing resistor is 10kΩ to 1MΩ.

(3) Power supply capacitor (Pin 8)

Connect a 0.02 μF capacitor between the power supply pin and the ground (GND) so as to prevent malfunction resulting from a rise in the impedance of the power supply line.

(4) Load (Pins 1 and 7)

A load of up to 5mA can be accommodated for both the inflow current and the outflow current.

●Operation notes

(1) Usage range for voltage

The recommended voltage range is 4.0V to 16V. Use of these ICs at 3.0V or lower voltage may cause the same mode as the input trigger signal to be output at around 2.6V.

(2) Input trigger

The input trigger level is 2.0V. The LOW level is 1.0V or lower and the HIGH level is 3.0V or higher. Trigger signals of 10ms / V or lower should be used for both the rising and falling edges.

(3) Time constant determining C·R

The recommended value for the timing capacitor is 1000pF or more and that for the timing resistor is from 10kΩ to 1MΩ.

The voltage, which is determined by comparison of discharge resistance and timing resistance in the IC, remains on the C and R pins. If timing resistance is set at 5kΩ or less, this voltage will reach threshold level (0.4 × Vcc), and operation will come to a halt. Also, when timing resistance is set to a low value, voltage remains on the C and R pins, which shortens the time constant. If timing resistance is set to 2MΩ or higher, the IC's internal comparator cannot be driven, which may bring operation to a halt.

(4) Note that pin connections and pin arrangements on the BA225 / BA226 (BA235F / BA226F) differ from those on the BA235 / BA236.

●Application example

Figure 8 shows an example of the circuit including these ICs, while Figure 9 shows the basic operation timing chart. Figure 10 shows the basic operation timing chart of the falling edge trigger type IC. When no trigger signal is applied, the output is in the LOW state and the timing capacitor is in the discharged state. When a trigger signal is applied, its rising edge causes the output to become HIGH and the timing capacitor to be charged.

The charging time of this timing capacitor is determined by the time constants of the external timing resistor and the timing capacitor. When the charged voltage reaches 0.4 × Vcc, the flip-flop in the IC is reset and the output state changes from HIGH to LOW. At the same time, the timing capacitor is discharged to be ready for the next operation.

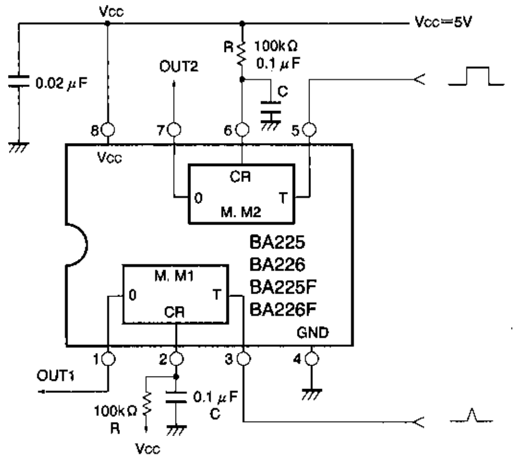


Fig.8

●Application examples

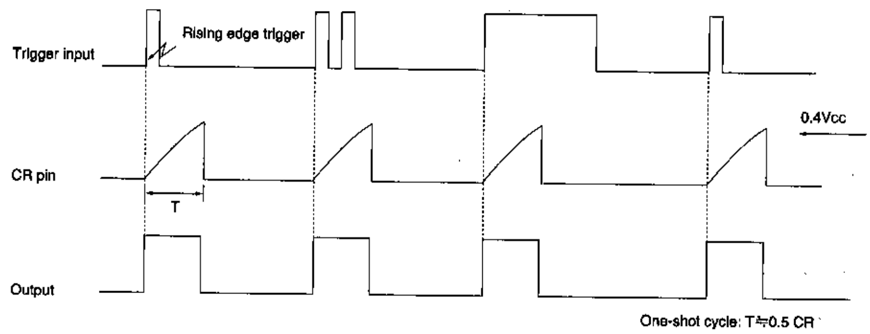


Fig. 9 Basic operation timing chart
(Rising edge trigger)

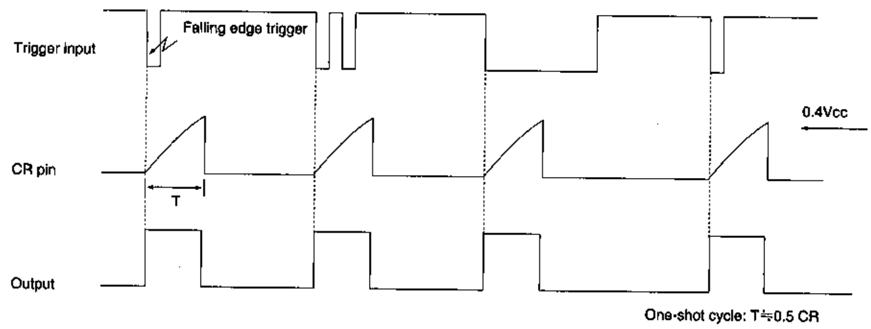
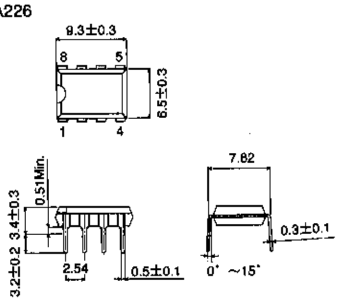


Fig. 10 Basic operation timing chart
(Falling edge trigger)

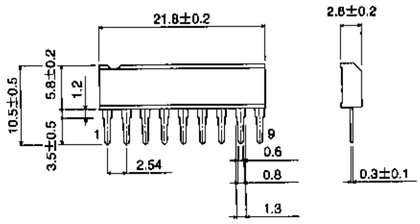
●External dimensions (Units: mm)

BA225 / BA226



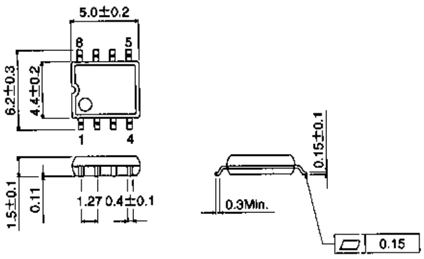
DIP8

BA235 / BA236



SIP9

BA225F / BA226F



SOP8